International Journal of Drug Policy 63 (2019) 101–110

Contents lists available at ScienceDirect

International Journal of Drug Policy

journal homepage: www.elsevier.com/locate/drugpo

Research Paper

#Drugsforsale: An exploration of the use of social media and encrypted messaging apps to supply and access drugs

Leah Moyle[a,*], Andrew Childs[b,d], Ross Coomber[c,d], Monica J. Barratt[e,f,g]

[a] School of Law, Royal Holloway, University of London, Egham, Surrey, TW20 0EX, United Kingdom
[b] School of Criminology and Criminal Justice, Griffith University, Mt Gravatt, QLD, Australia
[c] Department of Sociology, Social Policy and Criminology, School of Law and Social Justice, University of Liverpool, Liverpool, United Kingdom
[d] Griffith Criminology Institute, Griffith University, Mount Gravatt, QLD, Australia
[e] Drug Policy Modelling Program, National Drug and Alcohol Research Centre, UNSW, Sydney, NSW, Australia
[f] National Drug Research Institute, Faculty of Health Sciences, Curtin University, Perth, WA, Australia
[g] Behaviours and Health Risks Program, Burnet Institute, Melbourne, VIC, Australia

ARTICLE INFO

Keywords:
Drug markets
Drug dealing
Apps
Cryptomarkets
Dark net
Risk taking

ABSTRACT

Background: The use of new technology is frequently harnessed by drug suppliers to both increase profits and reduce risk. While a growing body of research has investigated drug sales through online pharmacies and cryptomarkets, despite growing media interest, no published research exists on how smartphone-enabled social media and messaging applications ('apps') are utilised in the drug economy. This study analyses the ways such apps (e.g. Snapchat, Instagram and WhatsApp) are utilised to supply and access drugs.
Methods: Three data collection methods were employed: an international online survey of 358 drug users that had either used or considered using apps to access drugs; 'rapid' interviews (n = 20) with a similar population; and in-depth interviews (n = 27). Key issues explored were the perceived benefits and risks associated with sourcing drugs through apps, with specific attention paid to novel supply and purchasing practices.
Results: Apps appear to provide a quick, convenient method for connecting buyer and seller. They were often viewed as a valuable intermediary option between cryptomarkets and street dealing, providing 'secure' features and the opportunity to preview product without the requirement for technical expertise. Apps are used in a range of novel and diverse ways, including as social networking spaces in which drugs are advertised, and as encrypted messaging services for communicating with known sellers and arranging transactions. Key anxieties related to potential for exposure to law enforcement and legitimacy of substances.
Conclusion: Though 'social supply' through friends is still typically preferred and there is a degree of wariness toward app-mediated supply, our data indicate that apps are fast becoming a viable option for accessing drugs. Apps can provide an easily accessible platform that connects buyers with commercial drug suppliers and substances that may otherwise remain elusive. Potential harms can be reduced through the provision of information which demystify common-sense assumptions that apps are secure and that this 'visual' drug economy promotes safer purchasing practices.

Snapchat, Instagram, cocaine and MDMA: How 'digital dealers' boast of making £13k a day selling drugs to kids. The Mirror (17th July 2017).

Introduction

A range of recent media coverage has alluded to the way that social media apps such as WhatsApp, Tinder, Instagram and Snapchat are providing new, easier than ever routes to both supply and access (mostly recreational) drugs. Historically, new communication technologies, often used to improve both safety and reach, have been taken up by the drug trade with enthusiasm (Natarajan, Clarke, & Johnson, 1995), and the use of the internet and internet-enabled smartphones have proven to be no exception to this trend (see Coomber & Moyle, 2017). Prior to the 1990s, retail drug markets were typically more open, that is, where dealers located in specified public places ('open air markets') sold to both known and unknown customers (Harocopos & Hough, 2005). While open air markets still exist in some places, pagers

* Corresponding author.
E-mail addresses: leah.moyle@rhul.ac.uk (L. Moyle), Andrew.childs@griffithuni.edu.au (A. Childs), Ross.coomber@liverpool.ac.uk (R. Coomber), m.barratt@unsw.edu.au (M.J. Barratt).

https://doi.org/10.1016/j.drugpo.2018.08.005
Received 9 February 2018; Received in revised form 22 June 2018; Accepted 6 August 2018
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and then mobile phone technologies were taken up to facilitate drug trading in private locations, without requiring participants to take the risk of encountering police in public places. These market arrangements became known as 'closed' markets (May & Hough, 2004), or as 'lounge room dealing', as opposed to 'street dealing' (Nicholas, 2008). New types of drug markets then arose in the 2000s, where websites were used to sell drugs directly to consumers. Email lists (Schneider, 2003) and websites offered psychoactive pharmaceutical drugs (Littlejohn, Baldacchino, Schifano, & Deluca, 2005), prescription medicines (Mackey & Liang, 2011) and new or novel psychoactive substances (Hillebrand, Olszewski, & Sedefov, 2010), many of which were 'legal' in some parts of the world. The sale of psychoactive substances through the internet retained some features of open markets, in that anyone could purchase without needing a social connection to a supplier, but also some features of closed markets, in that purchasers could remain in the comfort of their own home during the purchase. However, goods needed to be delivered by post, and payment to such websites (as well as their general use) could be tracked by authorities. In the 2010s, a new combination of digital technologies emerged in the form of the first 'cryptomarket', that is, an online marketplace that relies on anonymising technologies (e.g. Tor), cryptocurrencies (e.g. Bitcoin), and brings together a large number of buyers and sellers (Barratt, 2012). If used with care, cryptomarkets can be operated in an anonymous fashion, protecting the identity of both the buyer and the seller. Although goods still must be delivered, causing a risk to the buyer at the point of delivery, the risk is small due to the resources that enforcement agencies and postal organisations are actually able to commit to these prevention activities – especially for small amounts of drugs clearly for personal use (Aldridge, Stevens, & Barratt, 2017; Martin, 2014b).

An even more recent innovation, which is the topic of this paper - one that effectively negates the need for specific expertise (as with Tor based cryptomarkets) but also provides a level of hidden or encrypted communication (not provided by public listings on the surface net) - is the use of online social media and messaging applications or 'apps', typically used through smartphone technology, to trade and gain access to drugs. Although journalistic investigations into the use of apps for drug trading (e.g. BBC, 2017; Ferguson, 2016) appear to be increasingly prevalent, and while the use of 'Grindr' was discussed as a way of selling drugs by Aldridge in a conference paper as long ago as 2012 (see Aldridge, 2012), there is currently an absence of published academic research exploring the place of these new technologies in drug markets. This is so despite emerging evidence of increased use of benzodiazepines such as Xanax amongst British teenagers, with a number of media articles attributing this trend to its availability through the dark web, online pharmacies and apps (see Lee, 2018; Lewins, 2018). Despite there being opportunities for informed investigative reporting, many journalistic investigations have lacked depth and indeed veered, as is common with media reporting of drug related issues (see Coomber, Morris, & Dunn, 2000; Alexandrescu, 2018), towards unsubstantiated sensationalism. In July 2017, a BBC documentary '*Kids selling drugs online*' investigated how the use of popular social media apps like Snapchat and Instagram were 'revolutionising the way that young people buy and sell illegal drugs' in the UK. This documentary claimed that apps are commonly used to advertise the sale of illegal substances, providing a digital platform to post images and videos of product and providing the messaging service required to arrange a sale, either in person or through delivery. A number of melodramatic headlines and stories followed, branding social media apps as a 'dealer's paradise' (Gritt, 2017) where 'digital savvy young children buy and sell Class A drugs' (Lambert, 2017).

Elsewhere, in the US, Australia and beyond, online cultural magazines and user guides have also pointed to a trend toward app-mediated drug supply, providing some insight into some of the ways apps can be used to purchase illicit substances. For example, in an article entitled 'a user's guide to drug apps' the online magazine '*Hopes and Fears*' reviews a number of applications including apps linked to cannabis dispensaries such as the US based 'Weedmaps', 'Nugg' and 'Leafly', along with generic social media apps like Instagram and Wickr (see Lesser, 2015). Another online article explains that through social media apps like Snapchat, Instagram and Facebook, 'hashtagging' (a user generated label that enables the identification of content on a particular topic) and the use of 'Emoji's' (small digital images or icons used to express an idea or emotion) provide the gateway to access advertisements for sales of a range of substances: a diamond or snowflake for cocaine, a capsule for MDMA, and a needle for heroin (Ferguson, 2016).

Table 1 provides an indicative (rather than exhaustive) overview of apps available internationally which are commonly harnessed to facilitate drug supply, relating the diversity of services and features that can aid the advertisement and communication of drug deals. As this table shows, on social media apps such as Instagram and Snapchat, once drug buyers have identified sellers through searching these 'hashtags', they can opt to 'follow' them – if approved, enabling a user to see all of the 'followed' user's posts in their content feed. 'Following' the seller provides a platform to view product through photos and/or video posts of stock and it also affords a means of direct and private communication through in-built messaging services. Not all sellers will harness these apps in this way however, and once buyers contact sellers, they may instead be redirected to more secure messenger services such as Wickr or WhatsApp. These messenger services provide sellers with end-to-end encrypted communication to organise transaction details, and Wickr - alongside Kik, Telegram and Snapchat - has temporary photo and message capabilities that 'self-destruct' after a certain time period. App-mediated supply transactions commonly take place 'face-to-face' at local level through public meetings or home drop offs, with buyers connecting to local sellers through harnessing an app's 'location services' or using hashtags to identify sellers operating in their area. While local face-to-face meetings appear to constitute the primary means of exchange, forum discussion and media investigations also highlight the existence of a smaller group of sellers willing to post substances, with payment being processed through global money transfer companies such as Western Union (Borromeo, 2016). In regard to the overall prevalence of apps in drug markets, one recent media article from *Vice* reports that encrypted messaging technologies like Wickr have become so central to drug supply that they present the 'new way of online dealing' (Nolan, 2018). With (international) media interest in app-based drug markets increasing and a distinct academic research gap in regard to this particular form of online drug acquisition, this paper aims to provide the first empirical study to explore the particular ways in which apps are utilised to access drugs.

Reasons for internet drug purchasing

Despite the empirical research gap characterising the app-mediated drug economy, aspects of extant literature relating to other forms of online drug markets usefully apply to this growing market and offer some insight into possible motivations and barriers to access. In cryptomarkets, safety, quality, reliability and predictability are often referenced as reasons drug users purchase drugs online as opposed to through offline markets (Bancroft & Reid, 2016; van Hout & Bingham, 2013). Situational factors such as the individual's ability to access drugs through social networks and their location can also act as push factors towards purchasing in this way (Barratt, Ferris, & Winstock, 2014). While cryptomarket customers have to negotiate 'delivery dilemmas' (Aldridge & Askew, 2017), qualitative research suggests purchasers are commonly motivated by a desire to transact anonymously, without the fear of violence many associate with face-to-face trading (Aldridge et al., 2017; Barratt, Ferris, & Winstock, 2016; Martin, 2014a). Avoidance of these kinds of interactions are largely negated in app markets since most transactions take place locally and in person, yet, as Table 1 shows, evidence of online transactions exist, and in such cases, these features may also be relevant to app users. As well as promoting feelings of security, in cryptomarkets trust is also proactively promoted via

Table 1
Indicative Drug Supply Facilitation Methods Through Mobile Phone Applications.

Mobile Phone Applications	Description	Security Features	Security Issues	Drug Supply Facilitation Method
Snapchat	Snapchat is a multimedia messaging application that allows users to send self-destructing 'Snaps' (videos and photos) to other users. Snaps sent to 'followers' can be overlayed with text.	Snaps can be set to self-destruct after a period of time. Senders of snaps receive a notification when someone has taken a screenshot of a photo/video.	Unopened Snaps wait in limbo on servers until they are opened. If a search warrant is obtained, the company is required to hand over unopened snaps.	The supplier's username is often obtained from other locations (e.g., other social media apps, cryptomarket vendor pages or cryptomarket forums) or is a pre-existing contact. Snaps are sent from suppliers to followers to advertise products for sale. Text accompanying snaps will describe products and how to obtain (emoji's occasionally used in place of text). Followers can message through Snapchat or through another application as advertised by the supplier. Transactions commonly arranged locally but postage available.
Instagram	Instagram is a photo and video sharing social network application. Posts are shared with followers or groups of friends. Users and followers of profiles can view, comment and 'like' the shared photo or video.	n/a	User content and information is shared with Instagram's parent company Facebook as well as with third-party advertising companies.	Hashtags can be used to search for the profiles of potential suppliers (e.g., #buyweed). A supplier's profile allows potential buyers to view pictures and videos of stock. Followers can message through Instagram or through another application as advertised by the supplier. Transactions commonly arranged locally but postage available.
Wickr	Wickr is a messaging application that provides users with end-to-end encryption for all messages, photos/videos and file attachments.	Wickr provides end-to-end encryption for all messages sent between users. Messages can be set to self-destruct (delete) after a period of time.	Wickr does not currently have screen capture prevention methods in place.	The supplier's username is often obtained from other locations (e.g., other social media apps, cryptomarket vendor pages or cryptomarket forums) or it is a pre-existing contact. App provides a secure messaging service to arrange deals with known suppliers. Transactions commonly arranged locally but postage available.
WhatsApp	WhatsApp is a messaging application that uses end-to-end encryption for all messages, photos/videos and file attachments.	WhatsApp provides end-to-end encryption for all messages sent between users.	WhatsApp's privacy policy allows information to be shared with Facebook and other companies owned by Facebook.	The supplier's username is often obtained from other locations (e.g., other social media apps, cryptomarket vendor pages or cryptomarket forums) or it is a pre-existing contact. App provides a secure messaging service to arrange deals with known suppliers. Transactions commonly arranged locally but postage available.
Kik Messenger	Kik is an internet-based messaging application that allows users to send messages to friends or a group of friends.	Users can register without providing a telephone number.	IP address logged by the company.	The Supplier's username is often obtained from other locations (e.g., other social media apps, cryptomarket vendor pages or cryptomarket forums) or it is a pre-existing contact. App provides a secure messaging service to arrange deals with known suppliers. Transactions commonly arranged locally but postage available.
Facebook/Messenger	Facebook is a web based platform and social media application that allows registered users to share posts (pictures/videos) and comment on posts from other registered users. Facebook Messenger is a stand-alone internet-based messaging application that is connected to a users Facebook profile.	Facebook Messenger offers end-to-end encryption for messages between users but this is not the default setting.	Recently faced heavy criticism for failing to protect users' data.	Private Facebook groups where an invitation is required allow suppliers to advertise and provides a contact point for potential buyers. Deals over Facebook Messenger are often between individuals who are friends on Facebook (social supply). Transactions commonly arranged locally but postage available.
Telegram	Telegram is a cloud-based instant messaging and voice-messaging application with a focus on the speed of messages sent.	Messages can be set to self-destruct after a period of time. End-to-end encryption for messages and voice-calls.	Encryption has been widely criticised. Has come under scrutiny as being the preferred communication platform for terrorists.	The supplier's username is often obtained from other locations (e.g., other social media apps, cryptomarket vendor pages or cryptomarket forums) or it is a pre-existing contact. App provides a secure messaging service to arrange deals with known suppliers. Transactions commonly arranged locally but postage available.

(*continued on next page*)

Table 1 (*continued*)

Mobile Phone Applications	Description	Security Features	Security Issues	Drug Supply Facilitation Method
Tinder	Tinder is a location-based dating application. Users swipe right (like) or left (dislike) on potential matches, and allows users to chat if they have matched (i.e., both users swiped right).	n/a	Lack of encryption potentially allows interested third parties to view any photos or messages. IP address logged by company.	Users swipe through profiles searching for emojis to signify a dealer or an individual looking for someone to do drugs with (e.g., 'maple leaf' emoji to signify marijuana, "pill" emoji for ecstasy). Transactions commonly arranged locally but postage available.
Whisper	Whisper is an anonymous location-based social media application where users post 'confessions' as text superimposed onto a background image.	Assigned random username when signing up.	Privacy policy enables the company to establish a rough location of the user even when geo-location services are turned off.	More commonly used by buyers to indicate a requirement for drugs (e.g., "Anyone selling in xxx?"), but also used by suppliers to advertise drugs. Transactions commonly arranged locally but postage available.
Grindr	Grindr is a location-based dating application aimed at gay and bi-sexual men.	n/a	IP address logged by company.	Users swipe through profiles searching for emojis to signify a dealer. Transactions commonly arranged locally but postage available.
Yik Yak (no longer available)	Yik Yak was a social media application that allowed users to create and comment on discussion threads posted within an 8 km radius.	Messages are posted without a username.	Yik Yak maintained a log of information of the user as part of the guidelines for law enforcement.	Potential buyers and suppliers indicate an interest and willingness to buy/sell through posts. Radius restrictions on posts resulted in deals being organised more often in college/university settings. Transactions commonly arranged locally but postage available.

market structure as well as by vendors in order to attract further trade and income (Tzanetakis, Kamphausen, Werse & Laufenberg, 2016). 'Ratings systems' (Barratt et al., 2014), synonymous with many well-known cryptomarkets, provide users with an important centrally regulated review system which reduces the uncertainty commonly associated with illicit transactions and promotes confidence around drug quality (Bakken, Moeller & Sandberg, 2017; Martin, 2014a; Aldridge & Askew, 2017). In addition to trust and security, the availability, convenience and immediacy of online drug markets provide another important motivation for customers. Recent research spanning acquisition of illicit lifestyle drugs via the surface web suggests that convenience and the potential to access drugs unavailable in the Netherlands offer some of the most important motivations for purchasing online (Koenraadt & van de Ven, 2018). Such themes are also noted in cryptomarkets where wider availability and range increased frequency and use of new types of drugs (Bancroft & Reid, 2016), particularly during the 'honeymoon' period of cryptomarket access (Barratt et al., 2016:5). These findings therefore demonstrate that motivations for purchasing drugs through digital technologies are not dissimilar to the motivations described for accessing e-commerce more generally (Barratt et al., 2014). Indeed, despite apps most commonly *facilitating* offline supply rather than constituting a 'one-stop' virtual marketplace, given that app-mediated supply is initiated online, these new technologies and their capacity for convenience, quality and variety are likely to be meaningful for app users as well as cryptomarket customers.

Anxieties and barriers to online drug purchasing

While there are clear benefits associated with purchasing drugs online, there are of course certain barriers to utilising surface web and cryptomarkets to access drugs. Firstly, participation in cryptomarkets - and to some extent surface web purchases – requires a computer (or equivalent device) and a certain level of technical competence (Barratt & Aldridge, 2016). The hidden nature of 'Silk Road' and other cryptomarkets limits access to its members by outsiders (van Hout & Bingham, 2013) and access to the darknet is therefore dependent on possessing a special anonymising browser, a marketplace URL and cryptocurrency (Barratt & Aldridge, 2016). If access can be negotiated, then users of cryptomarkets can face other issues. While there has been an absence of research in this area, one study suggests that anxieties most likely to be mentioned in relation to cryptomarket purchasing include loss of money due to cryptocurrency volatility, customs seizure of product, loss of money due to market seizure/scam/theft, and waiting too long to receive the product (Barratt et al., 2016). Though cryptomarkets' sophisticated anonymising technologies are now commonly understood to 'evade worldwide prohibitive controls' (Aldridge et al., 2017: 1), it is nevertheless suggested that 'digital traces' (see Décary-Hétu & Aldridge, 2015) can provide opportunities for law enforcement to arrest and prosecute vendors. Cryptomarket customers are less likely to be apprehended in this way, and instead offline activities such as receiving deliveries are more likely to render them vulnerable to prosecution (Aldridge & Askew, 2017). Many drug users will choose not to purchase from cryptomarkets, and for this particular group one study suggests that the most common rationale offered is having 'adequate access to drugs through my own networks' followed by 'fear of being caught by police/customs if drugs are sent to my own address' (Barratt et al., 2014). Many of these issues are specific to cryptomarkets and their structures, and to the problem of not meeting in person to exchange money for drugs. In the context of app-mediated dealing, which uses technology to match drug buyers and drug traders but still typically results in a physical meeting, many of these concerns are unlikely to arise but nonetheless help us to understand some of the comparative appeal of harnessing apps to access drugs. With app-mediated markets situated somewhere in-between cryptomarkets and street-level drug markets, this paper describes the previously unexplored motivations, as well as the particular risks and anxieties attributed to purchasing drugs through mobile phone applications.

Methods

This research is based upon data obtained from three different methodologies: an international online survey, rapid face-to-face 'in-situ' interviews (Measham & Moore, 2009) and in-depth interviews, all conducted in the latter half of 2017. The online survey utilised a purposive sampling strategy to recruit prospective respondents through a combination of online advertising methods. The survey was advertised through the subreddit r/Drugs[1] and placed as a moderator announcement where it remained for a period of one month. At the end of the advertising period the survey had collected 358 responses from those who met the inclusion criteria for the study ('having sourced or had considered sourcing drugs through a mobile phone app'). The focus of the online survey was to gain quantitative baseline data on the demographics of app users, the apps they used and the drugs they purchased, the frequencies in which apps were used and the perceived benefits and risks of using them. Intentionally recruiting respondents who had considered but had not yet used apps also provided the opportunity to collect important data relating to the barriers and anxieties associated with using apps to access drugs. Providing broad, preliminary insights across (mostly) Australia, Canada, the UK and the US – spaces where apps are prevalent - the web survey was initially followed up with face-to-face 'rapid' interviews undertaken in Brisbane (Australia) with a further 20 individuals who met the inclusion criteria in order to explore which issues might pertain to a more local nuance prior to further depth exploration. These rapid interviews were based upon Measham and Moore's (2009) 'in-situ' interviews or 'sweep surveys' where interviews exploring polydrug use were undertaken in local leisure scenes (p.446). Survey data had indicated that the immediacy of drug access and unplanned 'in the moment' desire to access and use drugs was often heightened by activity in the night-time economy. As such, respondents were approached for interviews outside bars and nightclubs in Fortitude Valley, Brisbane, and were provided with details regarding anonymity and informed consent. Given the absence of academic research that explores the use of apps for drug supply, this approach provided a vital pilot study providing preliminary data to inform the in-depth interviews that followed.

Respondents undertaking in-depth interviews were recruited via snowball sampling through a privileged access interviewer (see Taylor & Kearney, 2005). Due to anxieties around anonymity, respondents elected to complete in-depth interview schedules manually and return them via the privileged access interviewer rather than undertake Skype interviews with the research team. In total, 27 interviews were collected; the vast majority of the sample were students (age range 18–32), and there was an even gender split (14 identifying as men, 12 as women and 1 as non-binary). As we outline below, the utilisation of a snowball sampling strategy meant that our in-depth interview sample is almost exclusively UK based. Though our research strategy was intended to recruit in-depth interviews from across the geographical spread of the international survey, unfortunately recruitment for in-depth interviews from the survey was unsuccessful leading to the use of purposive convenience sampling in its place. Whilst we acknowledge this as one limitation of our study and recognise the importance of the local context in understanding drug markets, we nonetheless suggest that many of the structural aspects of app-related drug transactions - as indicated by the survey - are generic in the perceived advantages and experiences and usage thus reflects this across space and place. Good depth focus on key issues in any one locale can in such circumstances – where structural conditions are similar – also provide meaningful indicative insight in others (see Pearson, Parkin, & Coomber, 2011). All respondents were provided with a £20 reciprocal contribution as an acknowledgement of their time (Ritter, Fry, & Swan, 2003). Survey data was processed via SPSS and qualitative interview data was coded deductively around emergent themes such as 'dealer spam', 'confidence', 'security', 'visual appeal', 'dealer preference', etc., with the resulting thematic analysis presented below. The study gained ethical approval from Griffith University Ethics Committee and all anonymised data have been provided with pseudonyms.

Findings

Demographic profile and patterns in app use

In order to understand the motivations, barriers and anxieties to accessing drugs through apps our research strategy aimed to recruit both 'app users' (people who use apps to access drugs) and those who had *considered* using an app. The online international survey consisted of 358 respondents: 318 identifying as men, 36 as women, and four as non-binary. Overall, 288 individuals identified as app users, and a further 70 as having considered using apps to purchase drugs. Age ranged from 18 to 60 and the modal value was 18 years old. Almost half of the sample indicated that they were from the USA (42.3%/n = 152), with strong representation also from Australia (20.6%/n = 74), followed by Canada (5.8%/n = 21) and the UK (4.7%/n = 17). A majority of the participants indicated that they were from a European/Caucasian background (86.1%); many were students (64.8%), and over half resided with a family member (64.1%). Highlighting app use as a relatively new phenomenon, just under half (44.3%) of the sample indicated that they had first used apps to access drugs within the last year, followed by just under a quarter of the sample (23.3%) indicating this to be within the last two years. A wide range of apps were reported as being used to access drugs (see Table 2) with social media platforms Snapchat and Instagram presenting the most commonly used apps, but high representation of instant messaging apps such as Wickr, Kik, WhatsApp and Facebook Messenger. Just over half of the survey population (64.5%) had used apps to purchase cannabis, followed by LSD (7.9%) and ecstasy/MDMA (6.5%) (see Table 3).

In regard to the ways in which apps were used, differences in the preferences of apps were found, with more Australian respondents preferring to use Wickr than any other country, but more respondents from the UK electing to use WhatsApp as an encrypted messaging service than other nations. In regard to the locations in which apps were used to access drugs, despite the potential for apps' 'location services' to connect customers and suppliers in non-local geographies, interestingly, those who had used an app to access drugs were instead far more likely to harness this technology to connect them with sellers operating in their hometown (92.7%). With regards the frequency in which apps were used by our survey sample, respondents were far more likely to have used apps on multiple occasions. Over half of those surveyed reported using apps 10 or more times (58.5%), compared to 8.8% of respondents who had only used apps once. Future intentions with regard to apps also revealed a willingness to engage in app-mediated markets, with over three quarters of the survey sample (84.3%) indicating that they plan to use an app to access drugs in the future. This proclivity to continue using apps was also conveyed in interviews, with respondents describing the convenience, visual appeal and perceived security features as key benefits associated with their use (see below).

Immediacy and convenience

The most commonly reported advantage of using an app to source drugs was that it was '*more convenient to organise a transaction*' (78.8%). This theme was also prominent in interview data where a number of respondents keenly extolled the sheer ease in which they could access a virtual platform and broker a drug deal without the need to hassle friends, seek out a street dealer, or use what they considered as the complex technology associated with cryptomarkets (see van Hout & Bingham, 2013). In contrast to cryptomarkets, social media apps were suggested to boast intuitive technologies that could connect users with 'people nearby' through ambient location sharing and interactive

contact maps. Lucy (21, Cardiff) reported '*messing around with street dealers, the dark web and friends for years'* as a means of accessing drugs and referred to her first time using Snapchat to buy cannabis as an '*epiphany*'. Describing their initiation into purchasing drugs through Instagram, Alex (27, Plymouth) comes to a similar conclusion:

> I felt like I'd woken up in the 21st century and that everyone around me was idiots. It was safe, easier and twice as quick as trying to nail down someone on the end of a line. The drugs turned up with the guy and I paid him and they were amazing. I never looked back.
> Alex (27) Plymouth

For many of the respondents interviewed, substituting previous supply methods and drawing upon apps to access drugs was described as an '*organic'* process (Olly, 18, Birmingham) likened to '*moving…with the modern world'* (Ethan, 21, London). Adolescents rely upon social media as a core component of their social lives (Yang & Brown, 2016) in order to build new peer affiliations, manage existing relationships and stay informed about social activities within their network (Ellison, Steinfield & Lampe, 2007). Although social supply clearly still predominates as a form of access for many groups and was identified as preferred supply method by our international survey sample (see also Barratt et al., 2014; Coomber & Moyle, 2014; Barratt et al., 2016), for those without reliable social networks, it simply made sense to employ these new social media platforms – many of which respondents were already harnessing for many of their everyday social interactions:

> It just seemed like a simple, modern way to buy things. I'd gotten pretty sick of the darknet because I never really got it, so had to always have a friend on hand to help me out. With apps its super simple, I get it and in no time I've managed to connect with strangers who I would've never been able to access before. Plenty of dealers in this area exist solely on Snapchat, so without it, I would've kept relying on people approaching me in the street or randomly bumping into people in clubs.
> Zach (22) London

Accompanying convenience, '*the speed at which drugs can be obtained'* was found to be the second most commonly reported advantage to using apps (58.6%). The immediacy of apps, hand-held, with familiar interfaces - mostly already downloaded onto users' smartphones - provided swift, straightforward access to substances with minimal tuition required. Many previous users of cryptomarkets compared this benefit with some of the key disadvantages of cryptomarkets – the need for technical expertise and waiting for packages to be delivered. As one respondent concluded, the mainstay of apps is their ability to *'combine the best features of the dark web with the best of old style street dealing in a secure and easy to use package'* (Danny, 23, London). Apps therefore seemed to offer an attractive 'intermediary' purchasing option that was easily available and operable, and could quickly connect buyer with seller.

Table 2
Mobile Phone Applications Used to Access Illicit Drugs (n = 222).

Mobile phone applications	'Yes'
Snapchat	169 (76.1%)
Instagram	48 (21.6%)
Wickr	37 (16.7%)
Kik	28 (12.6%)
Whatsapp	24 (10.8%)
Facebook / Facebook Messenger	22 (9.9%)
Telegram	18 (8.1%)
Tinder	14 (6.3%)
Whisper	10 (4.5%)
Grindr	6 (2.7%)
Yik Yak	5 (2.3%)
"Other" (Twitter, GroupMe, Signal)	17 (7.7%)

Table 3
Drugs Recently Purchased Through Mobile App (n = 214).

Drug	n (%)
Marijuana	138 (64.5%)
LSD	17 (7.9%)
Ecstasy/MDMA	14 (6.5%)
Mushrooms	10 (4.7%)
Cocaine	8 (3.7%)
Prescription stimulants	7 (3.3%)
Speed/Powder methamphetamine	4 (1.9%)
Prescription opioids	4 (1.9%)
Prescription benzodiazepines	4 (1.9%)
Heroin	3 (1.4%)
Ketamine	3 (1.4%)
Ice/Crystal methamphetamine	2 (.9%)

Range of substances

In addition to the convenience and speed of being able to access suppliers and order drugs directly from a social media platform, interview respondents also highlighted the range of substances available as a benefit of using apps. Cryptomarket research has highlighted the potential of these 'eBay-style' online markets to connect drug users with a wider variety of substances (Bancroft & Reid, 2016; Barratt et al., 2014, 2016). Survey data indicated similar themes in app markets, with buyers purchasing substances falling outside some of the more popular recreational repertoires, including drugs such as Mushrooms, LSD, and prescription stimulants/benzodiazepines (see Table 3). In qualitative interview data, Tim (23, London) was not alone in suggesting that access to a wider variety of substances was one of '*the best feature of apps'* as '*it is very rare to find a dealer out and about who carries psychedelics in this country'*. Moreover, in addition to increased access to psychedelic substances, elsewhere, other respondents described how apps provided them with access to substances they were previously unable to source:

> I couldn't get hold of oxy or codeine any other way because I didn't know anyone selling them so the first time I had both I brought them through apps.
> Jess (23) Coventry

> I hadn't ever used study drugs before I started buying them over Snapchat because I had never met anyone who carried them. One of the best features of apps is the chains it brings you into contact with, dealers often advertise other dealers and will give you their username if they know you want something they don't have.
> Zach (22) London

It should be noted that these qualitative findings (primarily a UK demographic) are at odds with the international survey where a third of app using respondents reported that a disadvantage of apps was that it was '*hard to find the drug I am after*' (34.7%). Given that almost a quarter of app users also reported the '*wide range of drugs available'* (23.4%) as a benefit of using apps, this may be in part due to the characteristics of the international survey sample, all active forum members who might be understood as a more experimental and/or seasoned group of users with more specific preferences in regard to the strain, strength or brand of substance required. It may also be a reflection of the different contexts in which apps are being used, with the UK app market perhaps more responsive to demand for psychedelics and prescription drugs (see Lee, 2018; Lewins, 2018). Further research focusing on availability and range is required to explore these nuances, both at international and national levels.

The ubiquity and 'security' of encrypted social media apps

The use of encrypted messaging services utilised to organise supply

transactions constituted one of the most popular ways in which apps were used to access drugs. Kik, Wickr and WhatsApp - apps which function primarily as instant messengers, but with added social networking features - were found to be the most prevalent of these apps used by international survey respondents (see Table 2). In interviews many of the respondents remarked that the use of WhatsApp as a messaging service to enable communication was not understood as a 'real app' per se and was so ubiquitous that it was now considered '*a natural extension of texting*' (Sam, 21, London). WhatsApp is now estimated to be used by around 1 billion people (Naughton, 2016) and its prevalence as a mobile application that can facilitate supply appears related to its general popularity - in the UK at least - as a messaging service supporting group forums and instant messaging that '*everyone uses*' (Lizzy, 32, London). In addition to ubiquity, it also offers the added benefit of end-to-end encryption. Though encryption was the most commonly cited security feature associated with apps, the capacity of other apps such as Snapchat and Wickr to provide transient ephemeral messaging, through auto-destruction or 'burn on read' settings was also suggested to provide some app users the somewhat illusionary assurance (see Table 1) of the protection of their digital trace (Décary-Hétu & Aldridge, 2015). These qualities were highlighted in a number of interviews both in the UK and Australia and appear to have traction in online communities where users make contrasts between the insecurity of text messages and phone calls with the 'safety' of Snapchat, which users reason 'does not store a database of users' 'snaps' (including still photos, videos and text) (see Reddit, 2013). Survey and interview data suggest these features not only attracted customers, but were also found to be appealing to some commercial suppliers who advertise product on Snapchat but require buyers to '*hash out the deal on WhatsApp*' (Ethan (21) London). Supporting the claims in recent media reporting (Nolan, 2018), similar themes were identified in Australia where despite WhatsApp failing to take hold as a form of app-mediated supply, it was instead suggested that many commercial suppliers insisted that orders were placed through another encrypted messaging service, Wickr, rather than traditional 'unsecure' methods. Therefore, in the same way that the advent of mobile phone technology in the 1990s offered an inexpensive, convenient form of communication that was deemed more secure than pagers and public phones (Natarajan et al., 1995), social media platforms and encrypted messaging services appear to be increasingly harnessed by *sellers* of illegal substances - offering a technology that does not require specialist knowledge (van Hout & Bingham, 2013), and provides some well-known security features that are expected to better protect them from police detection and prosecution.

Visual dealing practices and 'seeing' quality

Alongside convenience and accessibility, data suggests another of apps' key advantages relates to the notion that images and videos posted on social media platforms and sent via encrypted messaging service provided an opportunity to assess drug quality and safety. As well as harnessing the security features of apps, respondents widely noted the propensity for sellers to draw upon social media technology in novel ways in order to facilitate sales. Known as '*dealer spam*' by many app users, these practices included sellers 'following' users (on Facebook, Instagram and Snapchat) with the aim to get potential customers to notice them and 'follow' them back; sending group messages to existing customers advertising deals, prices and stock through WhatsApp and Wickr; and posting multiple videos and a range of different images of advertised product to followers on social media platforms such as Snapchat and Instagram. In some circumstances, Snapchat dealers would, for example, '*send out several messages a day*' to say what they have '*and any special offers*' (Zach, 22, London), or 'prove' the quality and legitimacy of their product through posting videos of '*themselves smoking, hanging with their stashes, or with their mates cruising on deliveries*' (Lucy, 19 Cardiff). Practices such as these appeared to hold much appeal for many app users who contrasted the perceived risks associated with purchasing street drugs from an unknown dealer to this visual drug economy. Several respondents explained that pictures of pills, white powders and prescription medicines were uploaded to advertise substances, in many cases providing 'valuable' and 'important' evidence that the substance was legitimate:

> The first time I bought coke it was through an app and I thought it was a better idea to buy it that way because I could look to see if it seemed cut with anything which is really for common for coke you buy on the street around here.
> Olly (18) Birmingham

> The first time I bought Xanax it was through Snapchat because I could watch the dealer opening sealed packets on his story before he sold them and I therefore felt safe consuming them…I would never buy anything I hadn't tried before from some guy on a street corner or anything at all really unless I was desperate.
> Lucy (19) Cardiff.

As Bancroft and Reid (2016) suggest, drug users often make judgements of drug quality based on colour, texture, smell and structure, and in offline 'street' drug markets these judgements tend to be unreliable, with limited opportunities for comparison and verification (Evrard, Legleye, & Cadet-Taïrou, 2010). Again, highlighting the 'visual' nature of many apps, a notable number of app using respondents claimed to be able to use photos and videos posted on social media apps or received via messenger to assess quality and claimed they could 'see' that a drug was unadulterated, safe and of a reasonable quality. This is not an unusual assumption in drug using populations, where a cursory examination of drug forums posts provide 'tips' for spotting good quality cocaine (see Bluelight, 2013), and in PIED using populations, with empirical research suggesting, for example, that the quality of drug packaging (wrongly) convinced some gym users of the 'authenticity' of counterfeit anabolic steroids (see Coomber et al., 2014). Unlike cryptomarkets, which have the benefit of vendor rating systems that offer detailed comments regarding the perceived potency of substances (Martin, 2014a), the ability to preview product provided illusionary reassurance that was perceived as unavailable in offline markets. Though not a rating system per se, a small number of respondents did reason that for Instagram users, 'likes' and comments on a single profile account functioned like '*Amazon reviews*' (Olly 18, London) and could provide a sense of security regarding the reliability of a particular seller. In this respect and overall, as one interviewee suggested, one of the greatest perceived benefits associated with purchasing drugs through apps was the so-called '*transparency*' of transactions. In regard to the level of drug information available, social media apps therefore seemed for many to offer '*far less than the dark web, [but] far more than the streets*' (Danny, 23, London).

Drug quality and personal safety

Though a subset of those interviewed conveyed a level of confidence in their capacity to draw upon the features of certain apps to discern quality and safety, international survey respondents expressed a greater amount of concern in regard to the quality of the product they were purchasing. When questioned about their key anxieties when using apps to access drugs, the survey sample was found to be most worried about '*receiving poor quality or fake drugs*' and '*receiving a substance that was the incorrect weight*'. These themes also emerged in some interviews. Below, Emma recalls her concerns:

> You have no idea if a teenage kid is just trying to sell you rubbish (or) cut substances… (and the) main issue (with apps) is the lack of trust in the dealer as there are so many online, social media dealers.
> Emma (21) Bristol

Zach (22, London) had also experienced some of these issues,

stating: *'I've definitely bought bad coke before that was cut with something, Mandy (MDMA) too*', and he later claimed that the adulteration of cocaine resulted in a friend having a '*fit*'. It should be noted that for app users reliant on messaging services like WhatsApp, Wickr, and even social media platforms like Snapchat and Instagram, some may already have an established relationship with a seller, while others might draw upon these technologies simply to facilitate social supply type arrangements, or may just use one seller rather than continuing to find new app sellers. Many interviewees had however experienced collecting drugs from a stranger after connecting through an app. In contrast to anxieties conveyed by many cryptomarket users regarding exposure to 'violent' street drug markets (Barratt et al., 2016; Martin, 2014a) the international online survey indicated that less than a quarter of app using respondents (23.4%) considered sourcing drugs from an unknown dealer as 'dangerous'. Many interviewees also described feeling unconcerned about this aspect of the transaction, and in Brisbane, one young woman admitted that she had not even considered these risks prior to meeting up with a seller unaccompanied. In contrast, those who had only *considered* purchasing drugs from an app seller were significantly more anxious, with 68.3% indicating this to be an issue. Though a small number of respondents employed strategies such as always taking someone with them when meeting a seller (Millie, 23, London), on the whole, app users had well-rehearsed narratives that justified their continued confidence in purchasing substances from unknown suppliers on apps, with a number asserting that it is '*bad for business*' for dealers '*to be bad at business'*.

Law enforcement and detection

Respondents who had *considered* using an app were found to be most worried about '*law enforcement becoming aware of the transaction'* and reported '*a potential encounter with law enforcement'* as the most common rationale for choosing not to use apps (65.2%). The digital 'trace' (Décary-Hétu & Aldridge, 2015) associated with online interactions between user and seller was deemed the most problematic aspect of using apps to purchase drugs and it was this 'trail' (Olly 18, London) that was perceived as having the potential to expose users to undercover officers, or as providing sufficient evidence of drug possession or supply offences:

> I have worries about the input of personal information, directly contacting a dealer and meeting them is not the issue. The issue lies with the process before you actually get hold of the drug itself. The planning, using personal information and having to actually go out of my way for it is something that is not attractive to me.
> Sophie (23) Slough

Many of those who had dabbled with app use or had only *considered* using apps to purchase drugs typically spent less time researching the security of apps and as a result they admitted feeling uncertain of the extent to which personal data could be tracked by law enforcement. In Brisbane, for example, a notable number of respondents were unclear about the security of Facebook Messenger. Though a small number of respondents claimed the service was encrypted, and '*not monitored by the Australian Government'* (LM, 03 Brisbane), others described feeling '*uneasy*' or '*nervous*' arranging deals through this app, stressing that they couldn't be sure they were not being monitored. This lack of knowledge led many 'would be' or infrequent app users to conclude that it just '*wasn't worth the risk'* (LM, 05, Brisbane). In contrast, more experienced app users (i.e. those who had used an app over 10 times) conveyed greater confidence in the security of apps, rating risk as lower than those who had only gained access on one occasion. In her research on young people's engagement with online drug discussion, Barratt (2011) notes the tendency for young people to believe they are unlikely to be targeted when undertaking supply transactions. In the context of app-mediated supply this logic was echoed and further compounded by some app users through reference to international news stories relating to app data security:

> I realised rather rapidly that Snapchat was totally secure, as was WhatsApp. Law enforcement agencies cannot [access] any data transmitted over these apps as was recently proven by several high-profile cases.
> Mark (23) London

Despite the majority of users being unable to guarantee that they could not be targeted by law enforcement, app technologies seemed to promote 'feelings' of security, often through the assumption that law enforcement would '*have a hard time penetrating apps'* (male, 22, Belgium) and reasoning that the likelihood they would be '*personally targeted by law enforcement*' (Vicky, 20, Bristol) was very low. This logic and the additional security features and safeguards provided by some apps therefore seemed to provide enough protection to persuade many app users that occasional purchasing was safe and would go undetected.

Discussion

The diversity of app use

In the past year, use of social media applications to purchase drugs has transitioned from a little-known supply practice sitting under the radar of many drugs field researchers, to a headline international news story. Though the mainstream media have portrayed the prevalence and risks of app use in a typically reductionist and sensationalist fashion (Coomber et al., 2000) and while over half of our survey sample suggested they would rather purchase drugs through social supply (Coomber & Moyle, 2014), data here does provide evidence to suggest that apps ranging from encrypted messaging services to social media platforms are fast becoming a viable option for accessing drugs. Findings suggest that apps were utilised in a diverse range of ways including as a secure messaging service to set up deals with established social suppliers and friends; as a digital platform where commercial dealers could advertise their product and attract new customers through the use of novel technology; or as a preferred 'secure' communication method between commercial dealers and their regular customers. In line with some cryptomarket (Barratt et al., 2014, 2016) and surface web research (Koenraadt & van de Ven, 2018), data indicated that convenience and the speed at which apps can connect a purchaser and a seller was an important attraction for app users. With many young people now 'growing up digital' (Children's Commissioner, 2017) and social media penetrating so many different facets of our social lives (Yang & Brown, 2016), it is perhaps unsurprising that these familiar and popular technologies have also been harnessed to provide accessible, handheld access to digital market places and more secure communication methods for buyer and seller alike. For some, the appeal of utilising apps to purchase drugs relates to their perceived status as an intermediary market that lies in-between cryptomarkets and street-level drug markets, where certain technologies are felt to increase trust and offer improved anonymity and security without the requirement of technical competence. For others, the use of apps was considered a natural progression of traditional methods such as texting, and graduation into this supply method was simply a case of 'moving with the times' or with their friends/suppliers' preferred communication method.

Misinformation and false-security

Despite many of our respondents describing anxieties about various aspects of app-mediated purchasing - particularly around the quality of drugs purchased and the legitimacy of sellers - this research did nonetheless engage with a significant number of more involved drug users who conveyed a certain level of assurance with respect to their

anonymity and safety. Interestingly, for app users, encounters with law enforcement and the consequent digital footprint or trail (Décary-Hétu & Aldridge, 2015) linked to their transaction was not deemed as the most worrying aspect of using apps to access drugs. Although users of apps such as WhatsApp and Wickr can, for the moment, perhaps afford to be confident of the well-publicised capacity for end-to-end encryption (Naughton, 2016), these qualities were often mistakenly ascribed to other apps such as Snapchat, Kik, and Facebook Messenger (available, but not a default setting). Moreover, message ephemerality does not always equate to security (see Table 1) and there are many third-party apps that, for example, target Snapchat's notification system (Varmazis, 2016). In the US context, unopened 'Snaps' also wait in limbo on servers until they are opened. In that time, if authorities have a search warrant, the Electronic Communications Privacy Act legislates that the company has to hand over the unopened Snaps left on their servers (Estes, 2013). Elsewhere, the future of encrypted security has also been called into question; in the UK, there have been repeated calls for police and intelligence services to be given access to encrypted messages on services such as WhatsApp (Hern, 2018), and the Australian Government have also pushed for social media and messenger companies to engage in cooperation and 'collaboration' with police investigations (Butler, 2017). Many caveats to security features can be explored, but the key point is that many app users are misinformed, or make erroneous assumptions regarding the protections they offer. The provision of education relating to the security risks of using apps is therefore essential.

App-based risks and harms

In addition to risks relating to app users' digital footprint and security, there are a number of other risks, specific to these technologies, that exist in the app-mediated drug economy. Unlike cryptomarkets, there is no robust, reliable method for buyer or seller to establish a positive reputation, and this is further compounded due to this environment representing a marketplace with little incentive for suppliers to transact honestly. For some buyers, the ability to be able to see photos and videos of product provided some assurance that the seller was legitimate and that the substance was safe. However, wider pharmacological research has long shown that the quality and safety of substances can only be measured through forensic testing and is not accessible through taste, smell or sight (see Cohen & Sas, 1994; Coomber et al., 2014). Considering apps like Snapchat and Instagram are deemed attractive due in part to their capacity for posting and sharing visual content, the belief that you can see and discern the quality and safety of a particular substance is especially problematic. In addition to their technological features, apps have also changed the drug supply landscape in other meaningful ways, providing a platform to a market that could be easily accessed by customers and has the potential to provide drug users with a means of connecting directly with commercial drug suppliers and substances that may otherwise remain elusive. Cryptomarkets do of course also provide access to a wider drug market and diversity of substances (Barratt et al., 2016). However, with around one third of respondents reporting previous purchases through surface net and cryptomarkets, and many interview respondents suggesting that their complexity can prohibit access, apps once again seem to offer an intermediary option for those without the technical expertise to access cryptomarkets (van Hout & Bingham, 2013). Given that most young people receive drugs from friends and acquaintances through social supply arrangements where they are largely protected from the wider drugs market (Coomber & Turnbull, 2007), they are less likely to have access or be exposed to a wider variety of substances beyond their normative repertoires. But with data suggesting that a younger demographic of drug users (M = 19.74) have used or have considered using apps to access drugs, the potential for apps to trigger what Aldridge et al. (2017) have termed a 'supply gateway effect' requires further investigation.

Conclusion

Though the media has cast social media apps as a 'dealer's paradise' (Gritt, 2017) and drug markets as undergoing a 'digital revolution' (BBC, 2017) in how they operate, this research suggests that in reality the picture is far more complex. At the time of writing, this research provides the first academic investigation into the use of mobile phone applications in drug markets. Our findings suggest that despite the growing media hype surrounding app-mediated drug supply, social supply remains the preferred access method for the majority of drug users and that anxieties regarding data security and risk of encounters with law enforcement prohibit many would-be users from relying on apps as a method for access. Due to the lack of empirical research in this area, our exploratory research aimed to investigate the broader take up of these global technologies and explore what might have been some of the attendant international issues relating to their use in facilitating drug supply. As a result, in this study we have focussed less on the localised patterns and nuances of supply transactions and encourage further research to explore this important area. However, despite these limitations, we hope to have provided both some preliminary insight that situates the diverse ways in which apps are harnessed to facilitate supply and some preliminary analysis of new trends and potential harms that are particular to app-mediated drug supply internationally. Due to the ubiquity of social media apps, their perceived convenience, and other factors outlined throughout this paper, it seems likely that their use will continue to grow, particularly amongst youth populations. While there have been calls for social media corporations to take concerted efforts to crackdown on illicit content (see Borromeo, 2016), it is also important that harm reduction advice is channelled toward app users. Educating young people about the possible risks of purchasing unknown substances from strangers on social media platforms is clearly both critical and urgent. As app-based drug markets continue to grow, demystifying the common-sense assumptions that apps are secure and that this 'visual' drug economy promotes safer purchasing practices may also serve to promote harm reduction and behaviour change in prospective users.

Conflict of interest

None.

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